

Serial No.: 10/045,364
Docket No.: PHUS017043US (PII 3341)

Amendment After Final and
Request for Reconsideration

Remarks

Telephone Interview

Applicants thank the Examiner for the telephone interview of 16 April 2004 during which the patentability of the claims in the present application were discussed in light of the prior art.

As a result of the interview, Applicants are submitting the amendments contained herein.

Claims

Claims 1-19 are pending in the application.

The Office Action states that claims 18 and 19 are allowed. Applicants appreciate the allowance of those claims.

The Office Action states that claims 4, 6, 12, and 16 are objected to as being dependent upon a rejected base claim, but are allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims. Applicants appreciate such indication.

Claims 1-3, 5, 7-11, 13-15, and 17 stand rejected under 35 USC § 102(b) as being anticipated by Granfors et al. (US 5,574,764).

Claims 1, 9, and 14 have been amended. Claim 8 has been cancelled. Claims 2-7 and 10-13 and 15-19 remain in the application unamended.

THE GRANFORS REFERENCE

Granfors *et al.* is directed to x-ray diagnostic imaging and, more particularly, to image brightness detection for digital x-ray imagers. *See*, Granfors et al., column 1, lines 6-8.

Granfors *et al.* teaches that a brightness detector is used to control the x-ray exposure and the displayed image level in a diagnostic x-ray imaging system. Initially, a region of interest of an image is specified. The average pixel value within the specified region of interest of the image is then found, taking into account regions of high brightness in the calculation and ignoring regions below a preselected low signal level threshold. Finally, the average pixel value is fed back to the x-ray generator to control the x-ray exposure. The average pixel value is also used to determine a scaling factor. This factor is applied to the image in order to maintain an

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optimum brightness level in situations where the desired exposure cannot be attained.
See, Granfors et al., column 2, lines 1-14.

Granfors et al. goes on to teach that both the size and position of the brightness region of interest (ROI) and the specific weighting of different parts of the ROI are controlled through use of a 1-bit mask memory 10, which receives a mask select via input 16. *See, Granfors et al.*, column 3, lines 21-24. Because different types of imaging require differently placed and sized ROI's, FIG. 1 illustrates that several different mask memories may be contained in the hardware. The appropriate mask memory may be chosen based upon the imaging procedure. *See, Granfors et al.*, column 3, lines 48-52.

THE PRESENT APPLICATION

As noted at page 11, lines 17-23, the present application includes the process of collecting and displaying image data while the operator views the images on the monitor 30. If there is a region of interest within the displayed image which the operator wishes to see in greater detail, the operator can use the operator interface 36 to select boundaries of the region of interest 12. The position of the operator interface 36 is superimposed over the fluoroscopic images as they are displayed on the monitor 30 so that accurate boundaries of the region of interest 12 can be selected. The display of the region of interest 12 is thereafter enhanced. In other words, the region of interest is defined by the user, not pre-selected from a mask memory as taught by *Granfors et al.*

THE CLAIMS DISTINGUISH PATENTABLY AND UNOBVIOUSLY OVER THE REFERENCES OF RECORD

Claim 1 as amended is directed a fluoroscopic imaging apparatus comprising an x-ray source for projecting x-rays through a subject, the x-ray source having a voltage and a current associated therewith; an x-ray detector for detecting radiation which has passed through the subject; a monitor for displaying an image indicative of the detected radiation, the image defining a field of view; an operator interface for defining a region of interest within the field of view wherein the region of interest is defined by an operator during image acquisition; and enhancement means for enhancing, in response to image data within the region of interest, a subsequent image of the region of interest.

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As set forth above, Granfors *et al.* teaches initially specifying a region of interest from several different mask memories contained in hardware. Granfors *et al.* does not teach or suggest an operator interface for defining a region of interest within the field of view during image acquisition as set forth in claim 1.

Applicants note that claim 1 has been amended to include the limitations of presently cancelled claim 8. Accordingly, no new subject matter has been added by the present amendment.

In light of the foregoing, Applicants respectfully submit that claim 1 is patentable over the prior art of record.

Claim 9 as amended is directed to a fluoroscopic imaging apparatus for enhancing, in real-time, a display of a region of interest within a fluoroscopic image, the apparatus comprising an x-ray source for projecting x-rays through a subject, the x-ray source having a voltage and a current associated therewith for controlling the projected x-rays; an x-ray detector for detecting radiation which has passed from the x-ray source through the subject; display means for displaying real-time video images indicative of the detected radiation on a monitor; a pointing device by which an operator defines a region of interest during image acquisition from within the video images; an image processor for generating a histogram of image data of the region of interest; an automatic exposure controller for controlling at least one of the x-ray source voltage and the x-ray source current in response to the histogram of the region of interest; and an automatic brightness controller for mapping the image data of the region of interest to a display scale of the monitor in response to the histogram of the region of interest.

The reasons for patentability set forth above in connection with claim 1 can be applied *mutatis mutandis* to claim 9. Accordingly, Applicants respectfully submit that claim 9 is patentable over the prior art of record.

Claim 14 is directed to method of fluoroscopic imaging comprising the steps of projecting x-rays through a subject using an x-ray source, the x-ray source having a voltage and current associated therewith; detecting radiation which has passed through the subject; displaying on a monitor an image indicative of the received radiation, the image defining a field of view; displaying borders of a region of interest, the region of interest being within the field of view and being defined by an operator during image acquisition and having a brightness and contrast associated

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therewith; generating a brightness histogram of the image data within the region of interest; adjusting at least one of the x-ray source voltage and current in response to the brightness histogram of the region of interest whereby the display of the region of interest is thereafter enhanced; and adjusting at least one of the brightness and contrast of the region of interest in response to the histogram of the region of interest whereby the display of the region of interest is thereafter enhanced.

The reasons for patentability set forth above in connection with claim 1 can be applied *mutatis mutandis* to claim 14. Accordingly, Applicants respectfully submit that claim 14 is patentable over the prior art of record.

Claims 2-7 depend from claim 1. For at least the reasons set forth above in connection with the patentability of claim 1, Applicants respectfully submit that claims 2-8 are patentable over the prior art of record.

Claims 10-13 depend from claim 9. For at least the reasons set forth above in connection with the patentability of claim 9, Applicants respectfully submit that claims 10-13 are patentable over the prior art of record.

Claims 15-17 depend from claim 14. For at least the reasons set forth above in connection with the patentability of claim 14, Applicants respectfully submit that claims 15-17 are patentable over the prior art of record.

Conclusion

Applicants submit that claims 1-19 distinguish patentably and non-obviously over the prior art of record and are in condition for allowance. An early indication of allowability is earnestly solicited.

If any extension of time is required relative to this Amendment A, Applicants hereby petition for such extension and provide the authorization to charge deposit account 14-1270 for the fees associated therewith.

Respectfully submitted,



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